REMARKS

Claims 1, 2, 4-9, 24 and 26 are pending in the application. Claim 1 is amended to clarify that the dispensed volume of the coating mixture is lower than the volumetric flow rate of the coating mixture from the mixing nozzle to the homogenizer. Support for the amendment may be found throughout the specification, e.g., at page 11, lines 7-10, which discloses that if the dispensed quantity of coating emulsion is lower than the volumetric flow rate of the pump connected downstream from the mixing nozzle, the excess amount of coating emulsion is recirculated.

Claims 1, 2, 4-9, 24 and 26 stand rejected under 35 U.S.C. § 103(a) as being obvious over WO 01/05860 ("Klinksiek") in view of U.S. Patent 5,723,518 to Kahl et al. ("Kahl") and U.S. Patent 6,020,419 to Bock et al. ("Bock") and U.S. Patents 3,892,698, 3,892,700 and 3,892,701 to Burke, Jr. ("Burke") and U.S. Patent 4,355,142 to Khungar et al. ("Khungar") and U.S. Published Application No. 2001/00012872 to Dong et al. ("Dong").

The present invention is directed to a process for the production of a two-component coating mixture comprising continuously:

a) mixing a first coating component and a second coating component in a mixing nozzle to yield a two-component coating mixture,

b) homogenizing the two-component coating mixture using a homogenizer, which is arranged downstream from the mixing nozzle, and

c) dispensing a volume of the coating mixture; and

d) recirculating at least a portion of the two-component coating mixture from an outlet of the homogenizer to an inlet of the homogenizer such that at least a portion of the two-component coating mixture is homogenized repeatedly;

wherein the dispensed volume of the coating mixture is lower than the volumetric flow rate of the coating mixture from the mixing nozzle to the homogenizer.

One of the primary advantages of the presently claimed invention is that the volume of coating mixture dispensed can be varied during the application process. In general, when relatively large quantities are removed from the system, a loss in pressure is generated which results in an increased amount of energy being introduced into the system. This increase in the amount of energy introduced produces an increase in dispersing power.

Conversely, where a lower quantity of coating mixture is dispensed, due to the lower amount of energy introduced, the dispersing power is decreased. Thus, prior art systems without any pressure equalization, i.e. recirculation, produce variations in the quality of the coating composition where variations occur in the quantities that are dispensed.

The result of the claimed process is that variations in the amounts of energy introduced and the resulting pressure differences are compensated by recirculating at least part of the coating mixture, thereby ensuring uniform coating quality (see Specification, page 11, lines 5-25). This is the case because quantities of the coating mixture can be dispensed during of the coating mixture in an interconnected, continuous manner.

Klinksiek discloses an adjustable jet disperser for producing two-component polyurethane emulsions. The Examiner indicates that the process utilizes a mixing nozzle wherein the polyisocyanate and polyol are initially mixed, and a jet disperser (downstream from the mixing nozzle) that performs the same function as applicants' homogenizer. The Examiner concedes that Klinksiek does not teach or suggest the use of recycle streams through homogenizers or repeat homogenization to improve dispersions and emulsions. The Examiner contends that such recycle streams were known at the time of the invention, evidenced by the secondary references.

Applicants traverse this rejection because none of the references, even when taken together, teach or suggest a continuous process utilizing a mixing nozzle and a homogenizer in which a portion of the coating mixture is recycled from the outlet to the inlet of the homogenizer and a portion of the coating mixture is dispensed during continuous operation. Even though Kahl et al discloses an embodiment in Figure 5 in which a coating mixture is recycled back into the jet disperser (homogenizer), this reference does not allow for recycle to occur at all times. In Figure 5 valve 44 is connected to an applicator, for example, a spray gun (column 4, line 55 to column 5, line 11). It is only when the dispensing is interrupted by closing valve 44 that valve 45 is opened for recirculation in order to avoid pressure build-up. During continuous operation no recirculation takes place. In the apparatus of Kahl, it would not be possible to recirculate the coating mixture while dispensing is taking place, as there is no pump in place to recycle the mixture.

Figure 5 also discloses batchwise mixing. When the process is interrupted and valve 45 is opened, no new materials from the batch mixer are needed. The recycled coating composition fills line 46, pump 40 and mixer 1. If materials were continuously mixed and discharged as required by the present invention, then there would be a build-up of material in the lines and equipment.

In the process shown in Figure 3 of Kahl the repeated homogenization is performed by forcing the mixture through several homogenizers which are arranged in series. This leads to an increased pressure drop because of the arrangement of the homogenizers in series. In the claimed process the mixture is homogenized repeatedly by flowing more than one time through the same homogenizer with subsequent recirculation.

Therefore, the pressure drop which has to be overcome is small compared to that of the process according to Figure 3 of Kahl.

The Examiner contends that this argument does not demonstrate a difference between the claimed recirculation and the arrangement of several homogenizers in series. The Examiner points to the fact that the inventors in Kahl apparently knew how to deal with pressure drop problem, as shown in column 2, lines 66 – column 3, line 2. Applicants respectfully disagree. The mere fact that the Kahl suggests a solution to the pressure drop problem (applying an increased pressure) does not mean that the arrangement of several homogenizers in series is the same as the presently claimed recirculation system. To the contrary, the series arrangement is more costly, as it obviously requires increased pumping capacity to overcome the pressure drop, as well as more than one homogenizer. It is noted that the present claims only require the use of a single homogenizer. Furthermore, Kahl's suggested alternative to the embodiment of Figure 3 is the embodiment of Figure 5, which is a <u>discontinuous</u> system. To that extent, Kahl teaches away from the use of a continuous recirculation system as required by the present claims. Finally, Kahl does not suggest a manner to overcome the problem of continuous dispensing of the coating mixture at low pressure. Even if the series of homogenizers accomplish mixing that is similar to the use of recycle, it does allow one to achieve uniform coating when the dispensing volume is low, as is the case with the presently claimed system.

Based on the teachings of Klinksiek and Kahl it would not be obvious to combine mixing in a mixing nozzle with a homogenizer using a recycle stream in a continuous process, wherein the dispensed volume of the coating mixture is lower than the volumetric flow rate of the coating mixture from the mixing nozzle to the homogenizer.

The deficiencies of Klinksiek are also not overcome by the teachings of the other secondary references. Even though the Burke, Jr. references disclose the use of homogenizers and recycle, these references do not suggest the continuous removal of product at low pressure, and certainly do not suggest a method for dealing with the resulting problems associated with such removal. Khungar et al and Dong et al also suffer from the same deficiencies as the Burke, Jr. references because they also fail to disclose the advantages which are related to continuous mixing prior to homogenizing and, in particular, do not disclose the use of a mixing nozzle as mixer. Further, they also do not suggest the continuous removal of product at low pressure, and do not suggest a method for dealing with the resulting problems associated with such removal.

With regard to Khungar, although lines 39-43 of column 5 refer to possible recycling, lines 46-50 of column 5 refer to the possibility of a number of homogenizers being provided "in series" to provide the same result as "recirculation". It is thus clear to one of ordinary skill in the art that only batch recycling can be meant, since only such batch recycling ensures that each fluid particle passes through the homogenizer as frequently as the number of recycling operations. In the continuous recycling process described in the present application, there is just one hydrodynamically mean flow coefficient, i.e. the frequency distribution of how often which portion of the fluid particles passes through the homogenizer. Thus, the arrangement of dispersers in series is <u>not</u> the same as continuous recycling.

With regard to Dong, paragraph [0015] of the description makes it clear that the processes concerned are carried out in steps. "After blending, the mixture is fed to a homogenizer . . . <u>once homogenized</u>, the emulsion is fed . . . ." The reference does not refer to the continuous removal of the emulsion and the process described is therefore different than the

presently claimed process, as it does not encompass similar problems, nor does it present solutions to those problems.

The Examiner relies upon Kahl et al and Bock et al for a disclosure of the use of homogenizers in series, which he considers to be analogous to using a recycle stream. However, as previously discussed when homogenizers are used in series a pressure drop occurs in each homogenizer. Therefore, the material must be under sufficient pressure to be able to pass through all of the homogenizers.

To the contrary when the coating mixture is passed repeatedly through the same homogenizer it can be repressurized before it re-enters the homogenizer by the circulation pump. Therefore, the use of homogenizers in series is not completely analogous to recycle, especially when product is removed at low volumes relative to the input to the homogenizer, as required by Claim 1.

Based on the preceding comments, it is submitted that the references do not disclose the advantages that are obtained by continuously mixing prior to homogenization and do not disclose the use of mixing in a mixing nozzle in combination with the use of homogenizers and a recycle stream in a continuous process, while at the same time allowing for continuous removal of the product at low volumes. In addition, none of the references disclose or suggest the modifications that would be necessary to be able to use recycle in the Kahl et al process during normal operation as opposed to only recycling during an interruption in the process.

With regard to the Examiner's argument that the word "continuously" does not apply to each of the recited steps in Claim 1, Applicants respectfully disagree. The word's position directly before the semi-colon makes it

clear that it applies to each of the steps that are recited immediately thereafter. Applicants would agree with the Examiner if the claim had been worded as "A continuous process for . . . "however, that is not the present case. Thus, the claim requires continuous mixing, continuous homogenizing, continuous dispensing and continuous recirculating.

Because no combination of Klinksiek, Kahl, Bock, Burke, Khungar or Dong disclose, teach or in any way suggest the claimed process, the claims are not obvious over those references. Therefore, the rejections of Claims 1, 2, 4-9, 24 and 26 under 35 U.S.C. § 103(a) should be withdrawn.

In view of the above amendments and remarks, allowance of all pending claims is respectfully requested.

Respectfully submitted,

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